

Recapitulating briefly, the present invention is directed to a code state determining method and an encoding apparatus.<sup>1</sup> As recited in independent Claim 13, features of the present invention include a codeword storage means for storing codewords, a next state transition means for monitoring a current codeword and a current codeword generator state and for transitioning between states corresponding to bounded DSV values *and for making at least one transition that violates the bounded DSV values*, and state storage means for storing the state of the codeword generator. An advantage of the present invention is that a magnetic recording system can be made at low cost.<sup>2</sup>

Attention is now directed to the patentability of Claim 13 over Karabed et al. Karabed et al is directed to methods employing an improved rate 8/10 matched spectral-null trellis code for PRML channels.<sup>3</sup> Karabed et al discloses a method for coding a binary data string for a partial-response channel having a transfer function with a spectral-null at zero frequency to provide a coding rate and an output which is invariant to 180-degree phase shifts in the channel output signal.<sup>4</sup> A finite-state machine is created having a plurality of pairs of states and a plurality of code words, each corresponding to a respective binary data byte.<sup>5</sup> Karabed et al, in Figure 2, discloses a seven-state subdiagram of the canonical diagram for binary sequences with spectral-null at F=0. The paths in the diagram generate all binary sequences with digital sum variation (DSV) bounded by 6. The DSV corresponds to the

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<sup>1</sup>Specification, page 1, lines 4 through 9, for example.

<sup>2</sup>Specification at page 25, lines 11 through 15, for example.

<sup>3</sup>Karabed et al at column 1, lines 9 through 18.

<sup>4</sup>Karabed et al at column 1, lines 52 through 58.

<sup>5</sup>Karabed et al at column 1, lines 57 through 60.

maximum variation in the running digital sum.<sup>6</sup> Figure 4 of Karabed et al illustrates a read-only memory (ROM) implementation of the finite-state-machine encoder 11 for the rate 8/10 trellis code.<sup>7</sup> Encoder 11 includes registers 20, 21 and a ROM 22. The output from ROM 22 is a 10-bit code word, two bits of which are recirculated via register 21 for denoting the next state.<sup>8</sup> Although Karabed et al discloses using state machines to generate code words, Karabed et al does not disclose means for monitoring a current codeword and a current codeword generator state and for transitioning between states corresponding to bounded DSV values *and for making at least one transition that violates the bounded DSV values*, as recited in independent Claim 13, and Applicant respectfully submits that independent Claim 13, and dependent Claim 14, are patentably distinguishable over Karabed et al.

Ino is directed to an encoding method in which a 10-bit code is obtained using an RDS (running digital sum) trellis where the difference between the maximum and minimum RDS values in the RDS trellis representing the change in the RDS associated with the 10-bit code is set to 6.<sup>9</sup> Ino further discloses that an invalid state transition in the detection trellis, which cannot be generated by the partitioned-matched spectral-null code is detected on the basis of the number of ones or zeros included in the code, the invalid state transition is removed from the detection trellis, and the Viterbi decoding is performed according to the resultant detection trellis.<sup>10</sup> Although Ino discloses that an invalid state transition is *removed* from the detection trellis, Ino does not disclose or suggest means for monitoring a current

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<sup>6</sup>Karabed et al at column 3, lines 29 through 35.

<sup>7</sup>Karabed et al at column 4, lines 51 through 53.

<sup>8</sup>Karabed et al at column 4, lines 55 through 63.

<sup>9</sup>Varanasi et al at column 2, lines 9 through 17 and column 6, line 62 to column 7, line 15.

<sup>10</sup>Ino at column 8, lines 1 through 9.

codeword and a current codeword generator state and for transitioning between states corresponding to bounded DSV values *and for making at least one transition that violates the bounded DSV values*, as recited in independent Claim 13, and Applicant respectfully submits that independent Claim 13, and dependent Claim 14, are patentably distinguishable over Ino, whether taken alone or in proper combination with Karabed et al.

Consequently, in view of the foregoing discussion, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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